Pollution from uncontrolled coal fires: Continuous gaseous emissions and nanoparticles from coal mines

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Abstract

In this investigation, the coal fires in different Colombian coal mines were studied using advanced electron beam and X-ray diffraction techniques. The results were compared with information from highresolution transmission electron microscopy (HR-TEM) equipped with a dispersive X-ray detector (EDS). Amorphous phases, salammoniac, anatase, muscovite, goethite, jarosite, calcite, gypsum, kaolinite, illite, and quartz are the dominant mineral matter constituents in almost all of the coal fires, with minute quantities of native sulfur, magnetite, siderite, pyrite, pickeringite, epsomite, hexahydrite, halotrichite being present in around half of the investigated coal fire samples. Other minerals that are present in some particular samples are chlorite, ankerite, and dolomite. Fe-sulfides were also detected particularly in the pyrite-bearing coal fires, possibly indicating oxidation of the Fe-sulfides occurring with coal fires. Exhaust discharge data indicate an overall trend of reducing carbon dioxide (CO2) and carbon monoxide (CO) releases (between 1.5 and 34%) from the coal fires. This is the first report on Colombian coal fires, which would be important for different perspectives of the research in the area.

Keywords:

Air quality, Coal fire, Uncontrolled contamination, Advanced characterization, Colombian coals